FIGHTER WEAPONS

NEWS LETTER

1954 No 3

JULY ISSUE

USAF FIGHTER WEAPONS SCHOOL

NELLIS AIR FORCE BASE

LAS VEGAS, NEVADA

Table of Contents

PAGE

RADAR REFLECTOR M-10 1

SPECIAL SECTION 7
1954 USAF FIGHTER GUNNERY & WEAPONS MEET

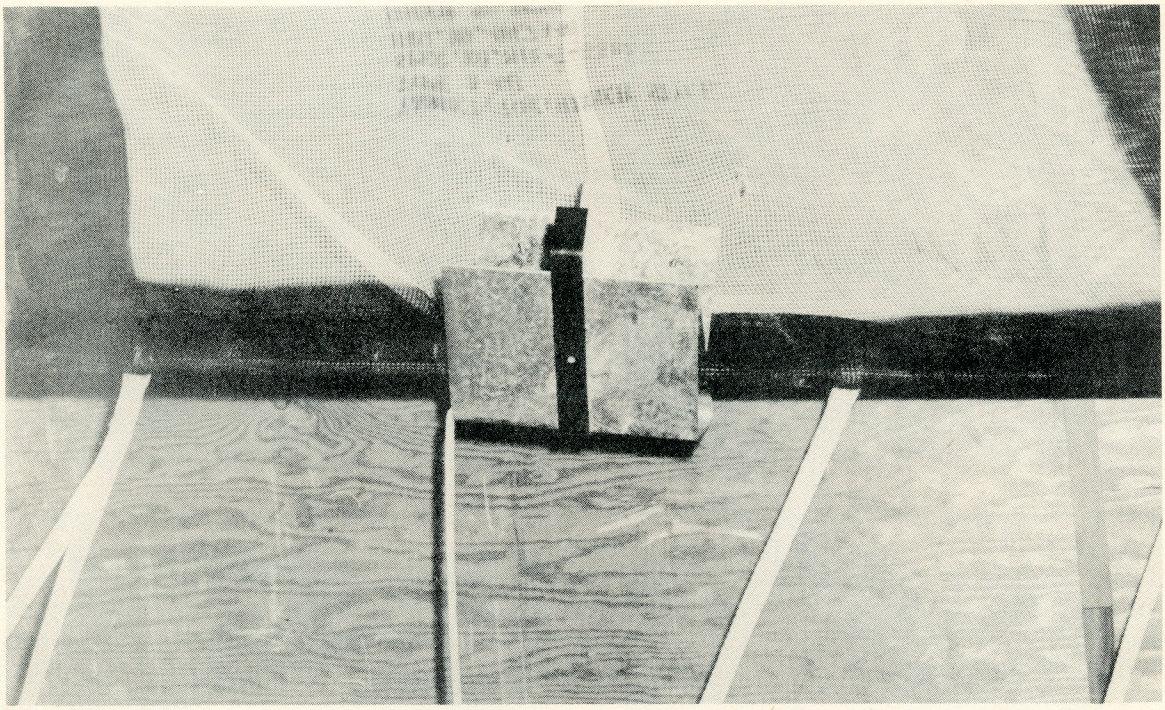
REFINED NELLIS F-86 HARMONIZATION PROCEDURE 27

A-4 SIGHTHEAD MODIFICATION 31

MY OPINION 33

CREDIT LINES

The policy has been established that, in the interests of unity and consolidation of effort, all articles in the Fighter Gunnery Newsletter that are products of the Fighter Weapons School will be published without credit lines. All articles published from any other sources will include credit lines, with the consent of the authors.



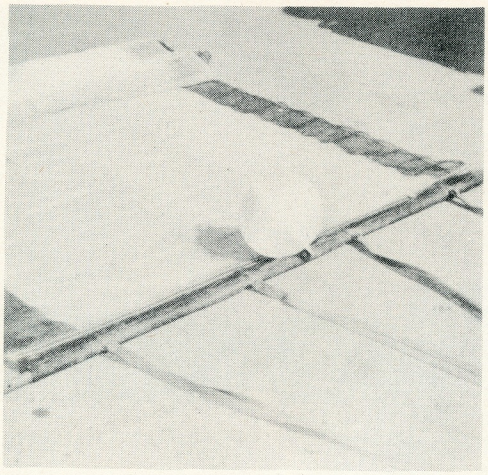
RADAR REFLECTORS 'THE M-10'

Exclusive use of the Anning type, M-10, radar reflector for all air to air firing during the recent USAF Fighter Weapons Meet was proof of the pudding that here was our best answer to date to the problem of securing reliable lock-ons using the MA-3 fire control system (A-1 and A-4 sights, and APG-30 radar) against banner targets. Extensive research and comparative analysis by the Fighter Weapons School's Training Research and Development Section, with Captain Jimmy Nichols as Project Officer, resulted in a clear cut lead for the M-10 radar reflector over all other types available to us. We recommend this reflector to all fighter units engaged in radar firing with the MA-3 system.

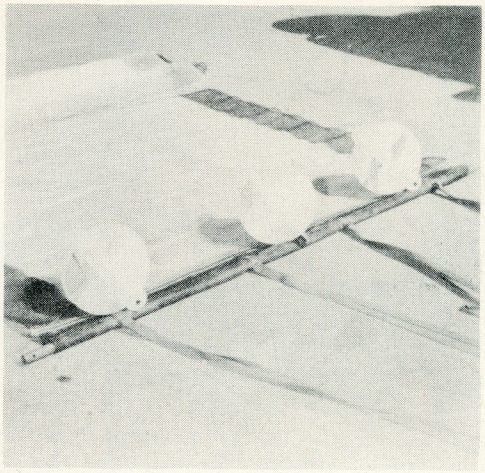
The purpose of FWS TR&D Project 53-4 was to find the reflector which could satisfy the majority of these requirements: (1) reliable and steady radar lock-ons from 4000' ranges, (2) availability in numbers, at the ZI bases, and in the field, (3) ease of mounting and operation, (4) if construction was necessary, ease of construction, (5) low cost, (6) durability during snake-off, firing, and drop, (7) recovery potential.

Types and combinations of reflectors tested were as follows:

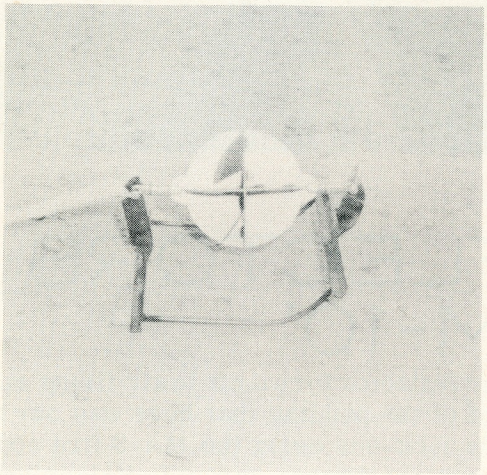
1. Single spherical, 10 inch X band reflector, non-rotating, mounted on the center of the tow bar. See Figure 1a, Type A.
2. Three spherical, 10 inch X band reflectors, non-rotating, mounted two feet apart on tow bar. See figure 1b, Type B.
3. Single shperical, 10 inch X band reflector, fully rotating, mounted at the apex of the straps. See Figure 1c, Type C.
4. Three spherical, 10 inch X band reflectors, non-rotating, mounted in series either at the center of the tow bar or at the apex of the straps. See figures 1d and 1f, Types D and F.



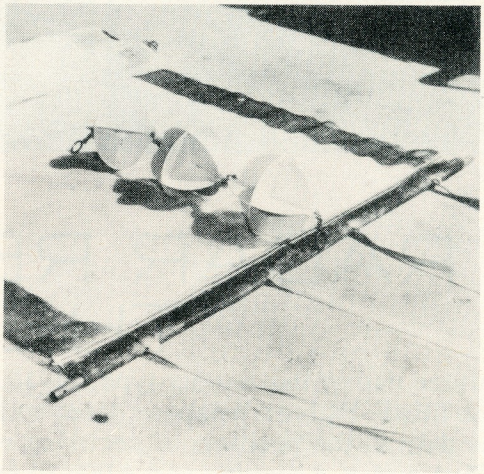
1A



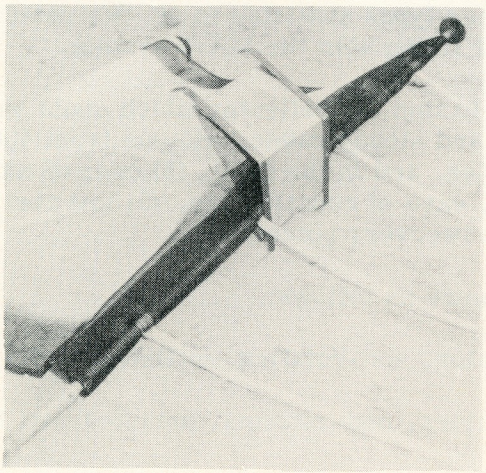
1B



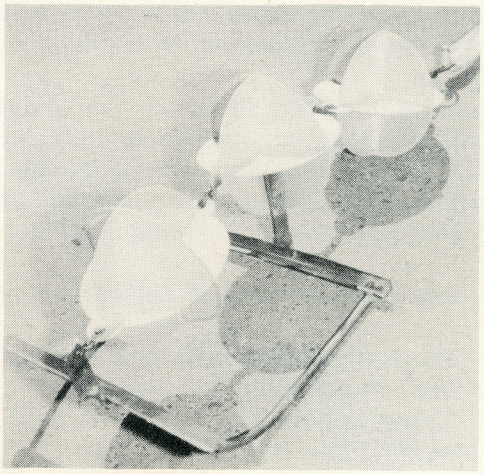
1C



1D



1E



1F

Figure 1

5. One M-10 type reflector, mounted at the center of the tow bar. See figure 1e, Type E.

Standard 6' x 30' polyethelene targets were towed 868' (750' of cable, 100' of safety web, 18' of target bridle) behind T-33's and F-86's at 15000', 20000', 25000' and 30000'. All launchings were by drag-offs from the runway, and all firing passes were from the standard high side pattern.

Tests with Types A and B proved them to be unsuitable for reliable radar lock-one.

Type C provided excellent lock-ons between ranges of 3400' and 3800', but required a "sled" to support it off the runway during drag-offs. This reflector, mounted between two swivels, owed its lock-on capabilities to its rotating feature. However, any damage to the fins during drag-off, or by bullet impact, destroyed the rotating capabilities and lock-ons became unsatisfactory.

Types D and F provided excellent lock-ons in the 3200' to 3600' ranges. The Type D rested upon the target during drag-off, receiving only slight damage. Holes were occasionally worn in the target during drag-off, but were of insignificant hindrance during target scoring. However, the location of these reflectors within the target caused them to sustain unacceptable damage from bullet strikes. The reflectors were moved to the apex of the straps to reduce bullet damage, Type F, but required again, the use of a "sled" during drag-off.

To the above deficiencies of the spherical X band reflectors were added the deficits of high cost, $5.56 per reflector, and $15.25 local purchase for the swivel assemblies, plus excessive assembly time.

The passage of time has obscured the details of origin of the Anning reflector, but original credit continues to belong to a Captain Anning from Bergstrom AFB. The first contact we had with the M-10 was one constructed predominatly from four ammunition cans, as per figure 2. An enterprising sheet metal specialist at Nellis decided that the time, effort, and cost involved in cutting the ammo cans could be bettered by constructing the M-10 as a unit entirely from .025 galvanized sheet iron. This was the reflector used during air tests, and from every standpoint the modified M-10, figure 3, evolved as the best radar reflector.

Reliable and steady lock-ons were attained at ranges of 3600' to 4000'. Manufacture is exceptionally simple, and attachment to the target is elementary. Cost, by the latest Las Vegas scale, is in the neighborhood of $2.75 - $3.00 complete. There is very little damage during drag-off; the reflector can sustain a number of bullet strikes and still remain effective, due to absence of moving parts; and the present re-use rate is two to three flights per reflector, depending on how many times you hit it, and how it strikes the ground after being dropped. Careful handling during stowing and movement of the assembled target and reflector, and during retrieve of the assembly adds appreciably to its life; however, it needn't be babied.

The M-10 is manufactured in five (5) parts, the single sheet of metal comprising the face and vertical fins, the two horizontal fins, and the two skids. The horizontal fins are riveted to the main piece to comprise the first assembly. The two skids are then bolted to the face to finish the reflector unit. To attach the reflector to the target, the vertical fins are spread around the vertical center of the tow bar, the bow of the reflector is placed snug against the tow bar, then the two vertical fins are bolted firmly together with the target between them by two bolts which pass through the target cloth. That's all there is to it.

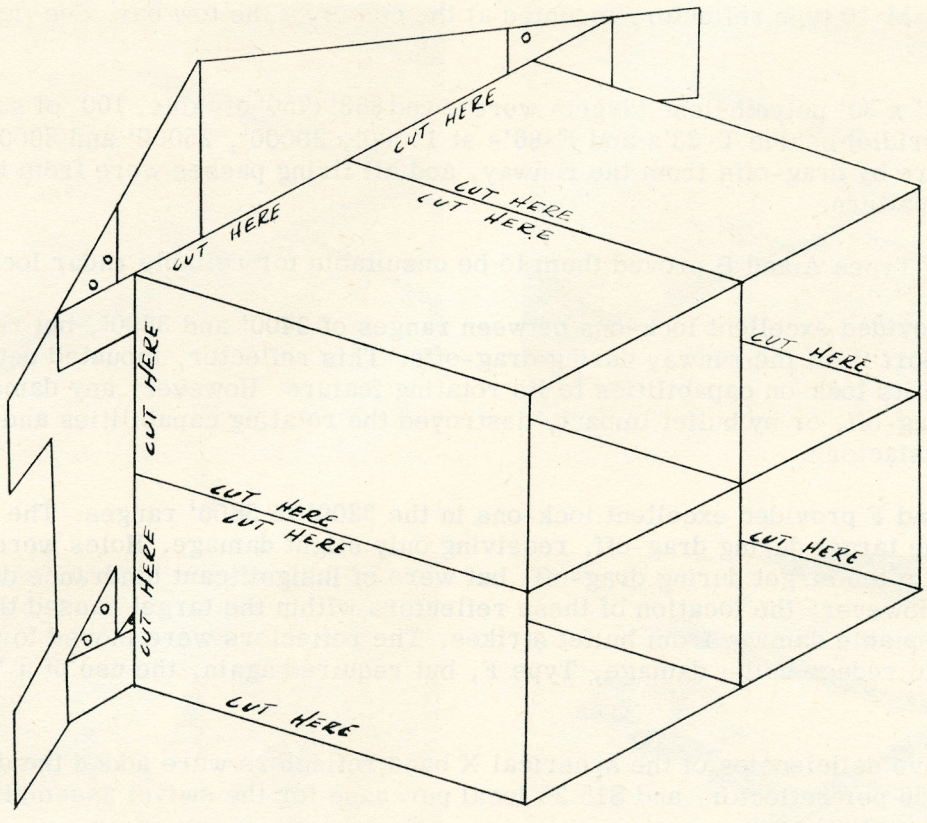
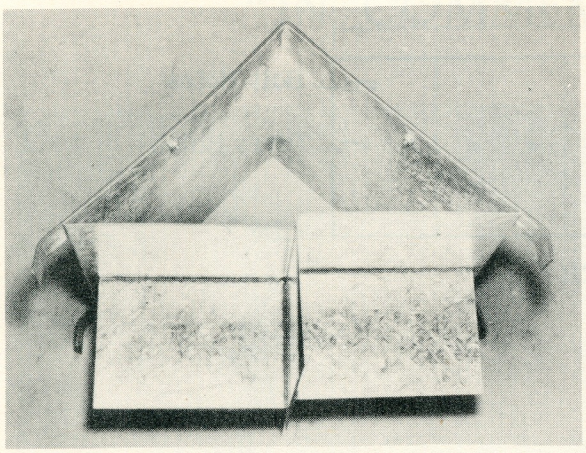


Figure 2

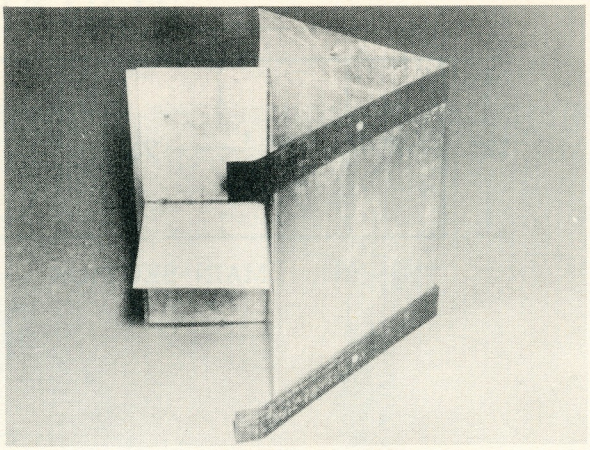
The skids serve two purposes. Primarily, they support the reflector off the runway during drag-off and minimize wear on the soft sheet metal. The skids are manufactured from 1/8" x 1 1/2" straps of mild cold rolled steel. The second value of the skids is that they serve as reinforcement for the face of the reflector, retaining it in its original shape during ground handling and dropping. If you are not too concerned with re-use of the reflector, a single skid across the vertical center of the face is adequate.

Drag-off conditions here at Nellis imposes the requirement for skids protruding from both sides of the reflector face. The continual take-off traffic necessitates the tow ships line up and begin their takeoff roll from one side of the runway. Depending on traffic direction, this may be either the left or right sides of the runway. To prevent the target from drifting off the near edge of the runway during take-off, the weighted end of the tow bar is always toward the center of the runway, inducing a drift in that direction. Therefore, the target and reflector may be dragged-off on either their right or left sides, undeterminable during target/reflector assembly, thereby requiring the two-ended skids. If you have a "canned" drag-off condition, you can use half-length skids and save more money. Extend the bow end of the half-length skid (s) at least two inches around the bow of the reflector for rigidity.

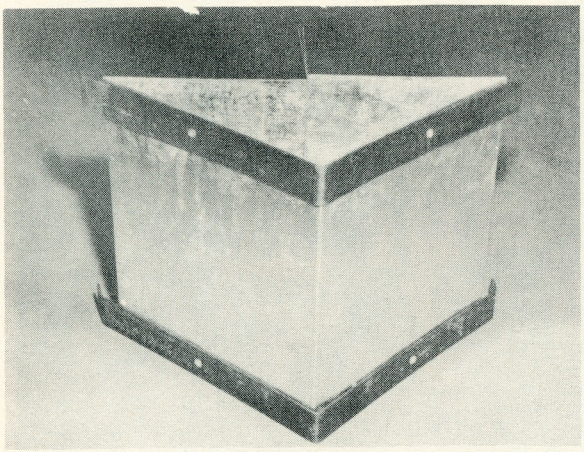
Details and dimensions of the M-10 are indicated in figure 4.



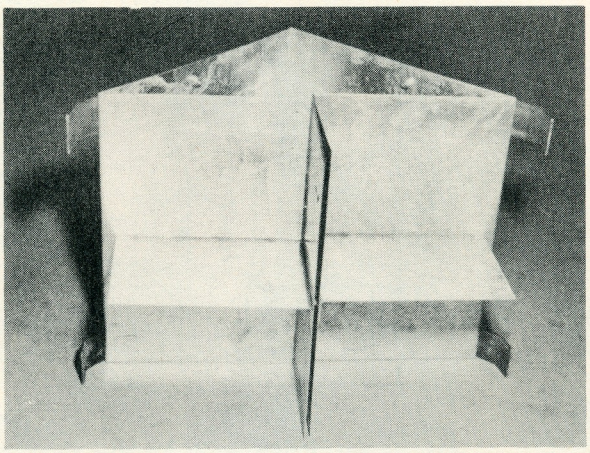
TOP VIEW



SIDE VIEW



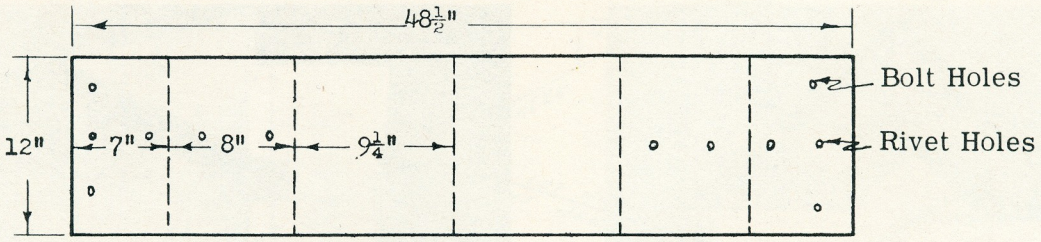
FRONT VIEW



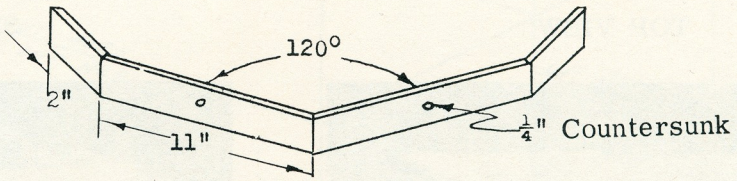
REAR VIEW

Figure 3

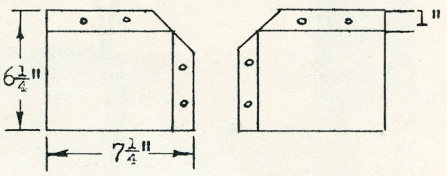
We are presently testing the pointing of the bow of the reflector more to reduce frontal drag. There will be no change in face dimensions other than slightly longer sides, but the bow angle will be reduced from its present 120^{O} to 90^{O}. We'll let you know if this proves advantageous.



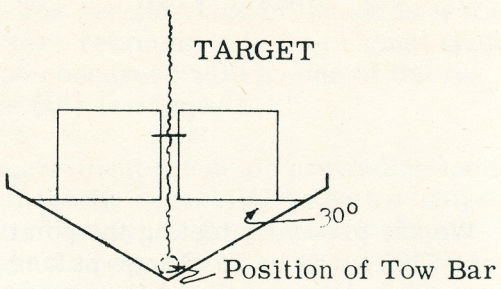
MAIN SECTION - 1 EACH



SKIDS - 2 EACH



FINS - 2 Each

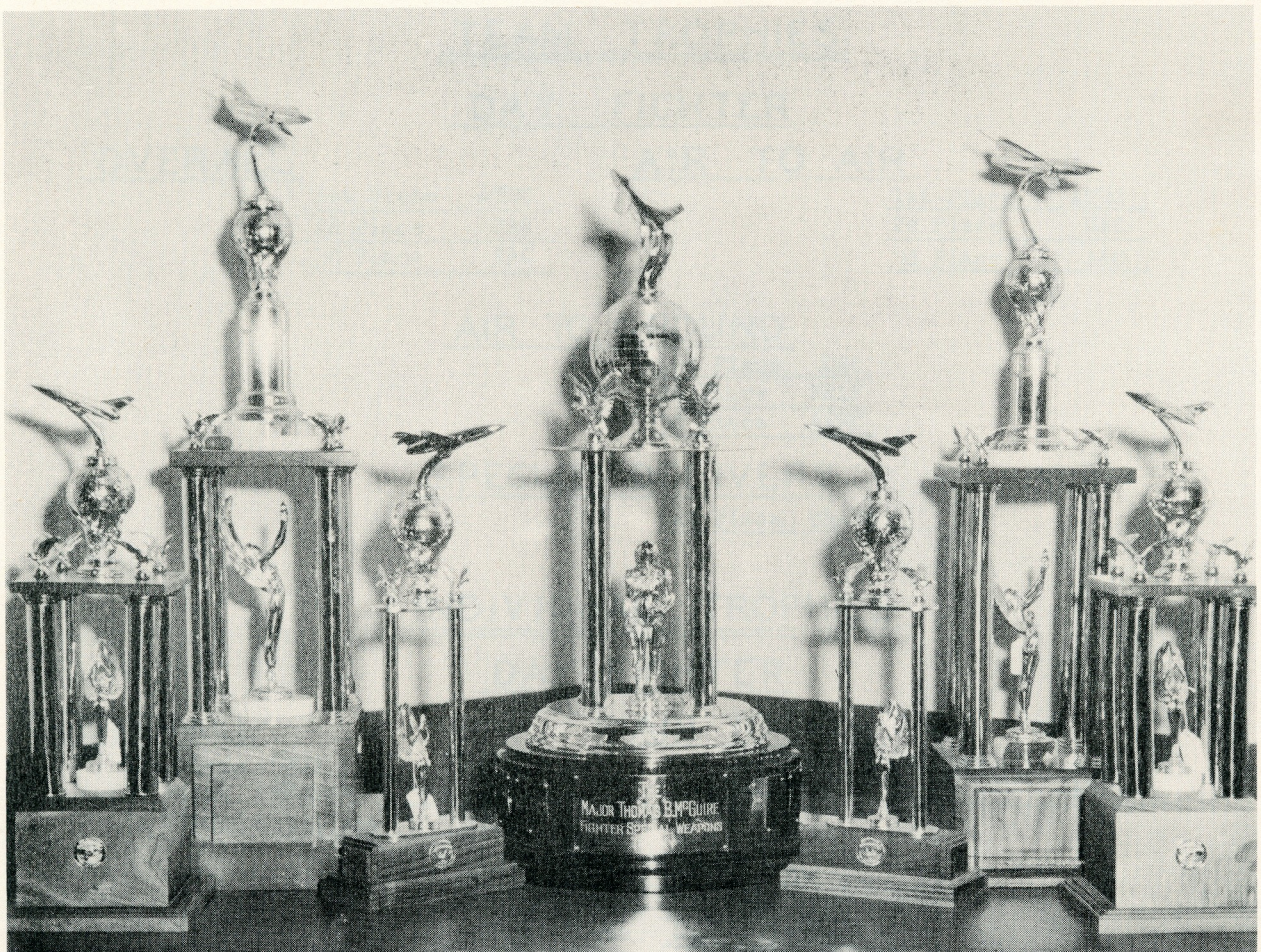


TOP VIEW

M-10 RADAR REFLECTOR

Figure 4

"IN COMMEMORATION. . . . "



SPECIAL SECTION

To Perpetuate The Memories
Of The Participants And The
Accomplishments Of The 1954
USAF Fighter Gunnery And
Weapons Meet III

TROPHIES

1954 USAF FIGHTER GUNNERY & WEAPONS MEET

TEAM TROPHIES

DAY FIGHTER

OVERALL

1st Place		ATRC
2d Place		SAC
3d Place		TAC

AIR TO AIR

1st Place		ATRC
2d Place		SAC
3d Place		AAC

AIR TO GROUND

1st Place		SAC
2d Place		FEAF
3d Place		ATRC

SPECIAL DELIVERY

1st Place		USAFE

INDIVIDUAL TROPHIES

DAY FIGHTER

OVERALL

1st Place	Carr	ATRC
2d Place	Maggert	SAC
3d Place	Williams	SAC

AIR TO AIR

1st Place	Wescott	ATRC
2d Place	Carr	ATRC

AIR TO GROUND

1st Place	Williams	SAC
2d Place	Chennault	TAC

HIGH ANGLE

1st Place	Chennault	SAC	
2nd Place	Diefendorf	TAC	Tie
	Schueler	SAC	

LOW ANGLE

1st Place	Wright	ANG
2d Place	Maggert	SAC

HIGH TEAM CAPTAIN

1st Place	Jones	ATRC

TEAM AND COMM.	CONTESTANT	PHASE I AIR TO AIR 20000 FREE STYLE		RADAR		27000 FREE STYLE	RADAR	PILOT A/A TOTAL	PHASE II AIR TO GROUND HIGH ANGLE ROCKETS		DIVE BOMB		LOW ANGLE SKIP BOMB		STRAFING		PILOT A/G TOTAL	GRAND TOTAL
NO. 1 FEAF	LOCKE	12	0	23	7	5	0	47	74	67	75	46	100	100	44	21	527	574
	MURRAY	39	27	30	31	0		127		59		86	100	100	32	27	404	531
	BARTHOLF						8	8	50	63	54	86	100	75	64	19	511	519
	SLAY						0	0	39	40	85	72	100	100	48	18	502	502
	THIELHORN	35	25	10	11	10	11	102										102
	POPE	34	27	19	4	0		94	51		13						64	158
	TEAM TOTALS							378	TEAM TOTALS								2008	2386
NO. 2 TAC	O'KEEFE	19	4	12	19	2	7	63	66	73	69	53	75	75	41	21	473	536
	CHENNAULT	11	9					20	68	76	57	80	75	100	53	24	533	553
	LAYMAN	14	31	22	24	18	17	126	74	41	69	69	100	50	34	14	451	577
	DIEFENDORF								52	60	83	81	100	50	39	29	494	494
	MAFFETT	22	18	35	29	16	16	136										136
	BOWIE			18	14	23	8	63										63
	TEAM TOTALS							408	TEAM TOTALS								1951	2359
NO. 3 ATRC	JONES	45	35	55	37	28	26	226	66	60	62	70	50	100	12	32	452	678
	WESCOTT	61	77	56	73	45	42	354										354
	CARR	72	75	55	54	46	41	343	63	73	68	57	75	100	42	31	509	852
	KASLER								68	56	60	51					235	235
	LATSHAW								69	44	79	72	100	100	0	47	511	511
	RICE	54	64	35	51	25	21	250					75	100	36	62	273	523
	TEAM TOTALS							1173	TEAM TOTALS								1980	3153
NO. 4 NEAC	DOWNER	0	16	19	15	1	4	55										
	ALMOND	24	1	8	10	8	9	60										
	PETERS	20	0	27	38	13	10	108										
	CROUCH	2	18	29	27	1	6	83										
	KENNEDY																	
	HUNT																	
	TEAM TOTALS							306	TEAM TOTALS									

NO. 5 ANG	EDMONDS	13	8	14	13	1	1	50	67	70	5	63	75	75	29	35	419	469
	EDWARDS					16		16										16
	ERICKSON						16	16										16
	GRAHAM	3	1	6	4			14	55	29	78	11	100	25	18	37	353	367
	WRIGHT	7	19	21	32	9	10	98	51	53	47	45	100	75	52	68	491	589
	JONES	26	39	30	43	12	19	169	52	22	58	60	75	75	52	81	475	644
	TEAM TOTALS							363	TEAM TOTALS								1738	2101
NO. 6 AAC	WIGHT	19	13	13	44	15	8	112										
	ERICH	2		11	17			30										
	ALLERY	6	0	41	57	36	30	170										
	RISLEY	9	19	16	27	3		74										
	CLEARY		11				1	12										
	AUGUSTINE					13	28	41										
	TEAM TOTALS							439	TEAM TOTALS									
NO. 7 USAFE	SIMLER	4	24	18	12	8	0	66	40	16	51	17	100	75	27	24	350	416
	BUTTERFIELD								64	64	58	59	75	50	50	25	445	445
	CATHCART								47	49	61	42	50	100	24	26	399	399
	McCANCE	18	19	7	16	2	6	68	77	78	5	25	100	75	30	22	422	490
	BENNETT	16	24	24	6	17	14	101										101
	MILLER	20	15	14	33	8	5	95										95
	TEAM TOTALS							330	TEAM TOTALS								1616	1946
NO. 8 SAC	WILSON	16	4	0	4	10	4	32	47	66	54	73	100	75	44	57	516	548
	MAGGERT	46	52	25	44	13	38	224	29	65	49	46	100	100	58	31	528	752
	SCHUELER								81	59	70	66					276	276
	WILLIAMS	34	28	0	69	18	40	189	68	67	51	85	100	100	37	43	551	740
	McMURRAY																	
	OVERSTREET	29	11	34	58	13	23	168					100	100	42	29	271	439
	TEAM TOTALS							613	TEAM TOTALS								2142	2755

NOTE COMPARABLE SCORES IN THE AIR TO AIR PHASE

The 1954 Air Force Gunnery Meet came to a close on the afternoon of June 14, with the awarding of trophies to the winners of the day fighters events in the base theatre at Nellis Air Force Base.

The Meet was originally scheduled to end on Saturday morning the 12th of June; however, two and one-half days were lost due to weather conditions over the aerial gunnery ranges. Several teams also had make-up missions to fly as their first targets were lost or unscorable.

This was the first time in Air Force history that all competing teams were flying jet aircraft. At the time of the last Air Force wide meet in 1950, some units were still flying conventional fighters.

The kickoff came right on time when the Air National Guard team took off at 0545 on the morning of June 6 to fire air to air gunnery. The next flight off was FEAF's team assigned to fire air to ground on Range Number 1. The FEAF boys made a perfect score in the skip bomb event on this mission. Due to their sharpshooting with bombs and rockets, FEAF established an early lead and maintained this lead through the first four days of the Meet. On Friday morning, however, the ATRC team from Nellis went into the lead on the strength of their air to air gunnery scores. ATRC went on to win overall honors with a total of 3153 points. On Saturday morning the SAC team came from behind to beat out FEAF for first place honors in air to ground and to take second place overall.

In addition to the eight teams competing in the day fighter events, four teams participated in a special delivery event. Due to the classified nature of this work, all that can be given here is the winning team. This event was won by USAFE's team from the 20th Fighter-Bomber Wing, led by Colonel John A. Dunning.

Range Number One was used for all air to ground events and this range was open to visitors, both military and civilian, throughout the week. Many residents of this area took advantage of this opportunity to see their Air Force in action. They were treated to several interesting demonstrations in addition to competition events. A flight of F-84's from Luke Air Force Base gave daily fire-power demonstrations; the "Thunderbird" team, led by Major Dick Catledge, gave performances Monday through Thursday; Friday and Saturday the "Sabre-Knight" team, led by Major Vance Gordon, gave an excellent formation aerobatic demonstration in F-86E aircraft. Also on Saturday morning we got our first look at North American's latest production fighter, the F-100. Mr. George Welsh, North American test pilot, made several passes over the range at speeds of Mach 1.1. These passes were made below 10,000 feet and without afterburners.

Nellis Air Force Base enjoyed its position as host to the 1954 Meet, and hopes to be associated with as many fine folks in 1955.

* * * * * * * * *

* * * * * * * *

* * * * *

The many friends and admirers (?) of Captain **John Roberts** will be pleased to know that he has returned from FEAF and is again **with the** USAF Fighter Weapons School. Presently working in the Training Research and **Development** Section, Captain Roberts can be expected to continue with his significant **contributions** in the field of fighter gunnery. We all remember when John won high individual **honors** in the 1950 USAF Figher Gunnery Meet.

AIR TRAINING COMMAND

(Day Fighter Team)

F-86-F

3595TH FLYING TRAINING WING
Nellis AFB, Las Vegas, Nevada

AIRCREW

Col G. L. Jones
Maj F. C. Blesse
Maj W. H. Wescott
Capt C. C. Carr
Capt R. T. Latshaw
Capt W. H. Rice

GROUND CREW

Capt J. L. Nichols
M/Sgt H. Rosenberry
T/Sgt L. D. Reid
S/Sgt D. Cantergrain
S/Sgt L. M. Dowdy
S/Sgt J. J. Kelly
S/Sgt H. B. McFaden
S/Sgt W. T. Minyard
S/Sgt J. R. Sparks
S/Sgt J. I. Weaver
S/Sgt B. F. Morgan
A/1C R. A. Ainsworth
A/1C S. Ayala
A/1C V. E. Bazemore
A/1C R. D. Dirk
A/1C R. C. Johnson
A/1C J. P. Pace
A/1C W. F. Seekins
A/1C O. Svetlichny
A/1C G. B. Wood
A/1C D. E. Zwald
A/2C L. L. Anderson, Jr
A/2C R. A. Martin
A/2C C. B. Yahle, Jr

AIR TRAINING COMMAND TEAM,
NELLIS AFB
WORLD CHAMPIONS US AIR GUNNERY
AND WEAPONS MEET 1954

FAR EAST AIR FORCE

(Day Fighter Team)

F-86-F

8TH FIGHTER BOMBER WING

AIRCREW

Col J. L. Locke
Maj H. J. Hoffman
Maj J. L. Pope
Maj V. A. Theilhorn
Capt J. C. Barthouf
Capt R. M. Murray

GROUND CREW

Capt. A. D. Slay
T/Sgt S. N. Phillips
T/Sgt B. L. Smith
S/Sgt P. L. Charron
S/Sgt J. C. Smith, Jr
A/1C C. W. Allen
A/1C W. Boltin
A/1C J. L. Hignutt
A/1C L. L. Kaufman
A/1C D. J. Rehill
A/1C M. Nelson
A/2C R. L. Anderson
A/2C A. W. Collins
A/2C C. Deal, Jr
A/2C D. L. Despins
A/2C R. P. Martinex
A/2C D. H. Mcelwain
A/2C E. J. Mobbs
A/2C R. L. Neveux
A/2C D. E. Perry
A/2C H. D. Ream
A/2C B. J. Steven
A/2C D. C. Will
A/3C J. C. Meyers
A/3C G. F. Yezman

TACTICAL AIR COMMAND

(Day Fighter Team)

F-86-F

366TH FIGHTER BOMBER WING
Alexandria Air Force Base, Louisiana

AIRCREW

Col T. F. O'Keefe
Capt C. O. Chennault
Capt A. J. Diefendorf
Capt T. Maffett
1/Lt B. W. Bowie
1/Lt L. J. Layman

GROUND CREW

1/Lt W. L. Morgan, Jr
CWO L. Schaefer
M/Sgt F. H. Rice
T/Sgt W. E. Bell
T/Sgt I. Rowe
S/Sgt M. H. Baker
S/Sgt L. G. Deal
S/Sgt D. D. Dunham
S/Sgt S. W. Gregg
S/Sgt C. L. Wightman
A/1C C. S. Chumney
A/1C A. A. Craycraft
A/1C D. L. Huston
A/1C E. L. Shutt
A/1C E. D. Zenk
A/2C J. C. Bates
A/2C R. G. Crank
A/2C G. H. Fuller
A/2C F. Giattina
A/2C T. L. Kelly
A/2C J. R. Reider
A/2C E. J. Risey
A/2C J. Young
A/3C B. W. Nobles

NORTHEAST AIR COMMAND

(Day Fighter Team)

F-94B

318TH FIGHTER INTERCEPTOR SQUADRON

AIRCREW

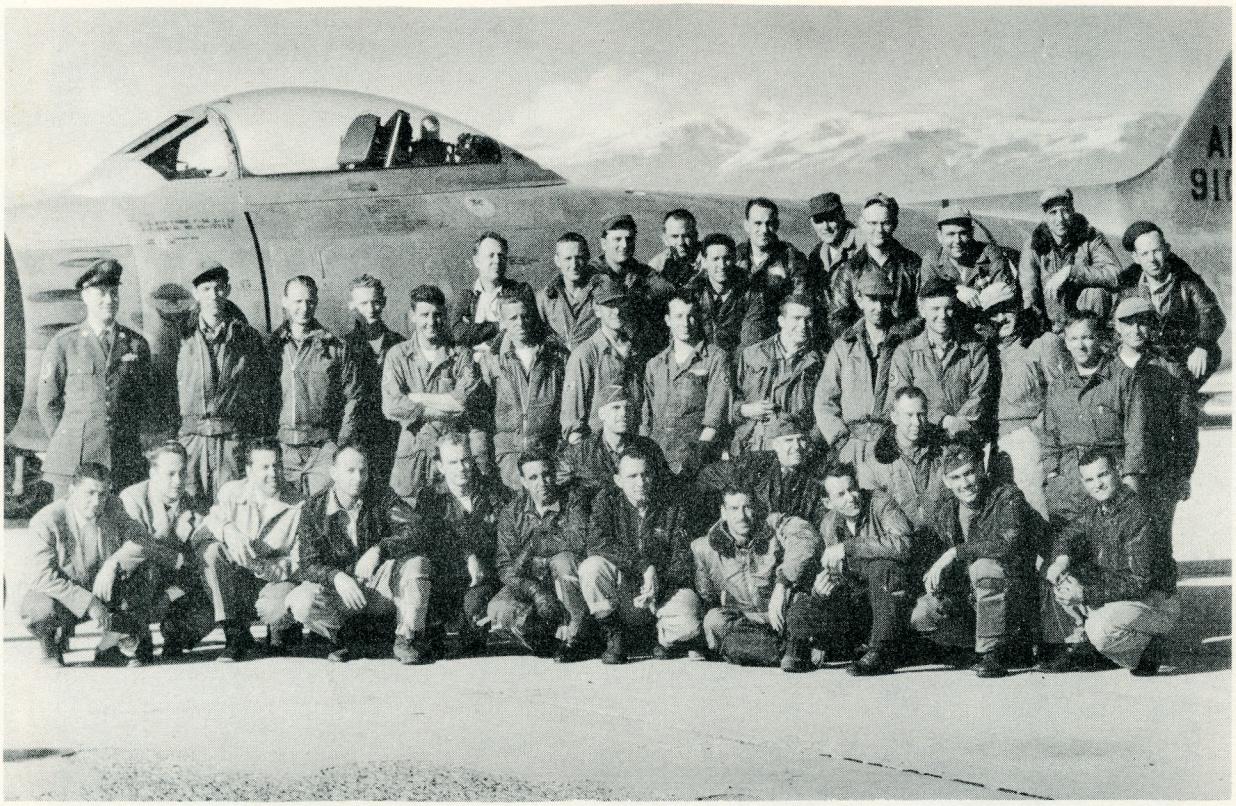
Col C. B. Downer
Capt C. P. Almond
Capt R. O. Kennedy
Capt C. A. Peters
Capt W. F. Truitt
1/Lt W. M. Baker
1/Lt W. L. Brown
1/Lt A. B. Crouch
1/Lt C. R. Ehlert
1/Lt B. B. Hunt
1/Lt L. F. Merriam
2/Lt G. R. Powers

GROUND CREW

Capt M. K. Crutis
1/Lt W. J. Delancy
1/Lt L. H. Hutchinson
1/Lt R. M. Simth
2/Lt R. C. B. Wright
M/Sgt H. Koral
T/Sgt C. B. Fitzgerald
T/Sgt J. Legg
T/Sgt R. L. Wood
T/Sgt A. L. Edminister
S/Sgt L. R. Duncan
S/Sgt H. T. Halverson
S/Sgt V. E. Larson
S/Sgt E. L. Phillips
S/Sgt D. J. Stemper
A/1C D. W. Adrians
A/1C J. F. Garland
A/1C R. D. Hill
A/1C J. F. Miller
A/1C C. R. Neumann
A/1C J. H. Schreck
A/1C J. L. Smart
A/1C R. H. Walde
A/1C E. E. Yzinhauer
A/2C R. H. Black
A/2C H. R. Heinz
A/2C A. D. Schreiber
A/2C L. J. Voltolina
A/2C V. Wargo
A/3C D. E. Bader

AIR NATIONAL GUARD

(Day Fighter Team)



F-86A

191ST FIGHTER INTERCEPTOR SQUADRON
Salt Lake City, Utah

AIRCREW

L/Col G.W. Edmonds
Maj J.W. Edwards
Maj R.E. Erickson
Maj M.R. Graham
Maj R.R. Wright
Capt A.R. Jones

GROUND CREW

E.R. Aguiar
W.E. Anderson
H.E. Applegate
A.H. Asay
D.S. Bain
W.G. Bessey
R.L. Chambers
W.E. Gately
D.K. Giles
S.A. Gill
A.J. Guresz
E.A. Hill
Capt I. Burch
Capt A.J. Porter
E.I. Kalkowski
C.E. Littlejohn
B.E. Marsh
M.A. Mason
G.A. McNab
F. Mollica
M.C. Nisbet
R.D. Rigby
J.A. Rogers
J.D. Smith
S.J. Tomich
E. Vlaardingerbroek
1/Lt Kilpatrick, J.A.
S/Sgt J.S. Woolf

ALASKAN AIR COMMAND

(Day Fighter Team)

F-94B

64TH FIGHTER INTERCEPTOR SQUADRON

AIRCREW

L/Col C. H. Wight
Capt K. E. Allery
1/Lt A. C. Barbee
1/Lt E. E. Cleary
1/Lt N. R. Erich
1/Lt C. B. Jiggetts
1/Lt L. H. Augustine, Jr
1/Lt D. R. Lee
1/Lt C. G. Long
1/Lt G. H. Risley
2/Lt J. G. Massey
2/Lt D. E. Medlin

GROUND CREW

WOJG A. A. Samson
M/Sgt F. C. Wilson
T/Sgt K. K. Knoble
S/Sgt M. G. Edwards
S/Sgt R. N. Harten
S/Sgt M. R. Lauer
S/Sgt J. K. Meador
S/Sgt B. G. Payne
A/1C F. W. Brodtrick
A/1C W. G. Copeland
A/1C S. W. DeVall
A/1C F. M. Echart
A/1C R. D. Elerick
A/1C A. G. Franchio
A/1C G. V. Harold
A/1C J. A. Hazelwood
A/1C R. G. Magnan
A/1C J. E. May
A/1C E. H. McBee
A/1C J. B. McPeters
A/1C H. L. Merrifield
A/2C R. L. Feyerabond
A/2C W. G. Mallory
A/2C W. J. Nadolski
A/1C B. J. Herring

UNITED STATES AIR FORCES IN EUROPE

(Day Fighter Team)

F-86-F

86TH FIGHTER BOMBER WING

AIRCREW

Col G. B. Simler
Capt A. P. Butterfield
Capt C. E. Cathcart
Capt D. L. McCance
1/Lt C. A. Gabriel
1/Lt A. M. Miller, Jr

GROUND CREW

Capt C. F. Preston
M/Sgt R. R. Bogard
T/Sgt W. L. Petering
T/Sgt J. A. Ritchey
S/Sgt I. E. Cotton, Jr
S/Sgt E. H. Davis
S/Sgt O. E. Dix
S/Sgt J. D. Frank
S/Sgt S. Goldwatergn
S/Sgt L. Jerzewski
S/Sgt D. L. Huston
S/Sgt H. N. Parks
S/Sgt L. D. Rahe
A/1C R. E. Burlingame
A/1C D. D. Critterden
A/1C R. A. Doeler
A/1C J. J. Falque
A/1C H. E. Petersen
A/1C E. E. Reed
A/1C C. R. Rogers
A/1C R. Spann, Jr
A/2C V. J. Gibney
A/2C D. E. Miller
A/2C J. A. White

STRATEGIC AIR COMMAND

(Day Fighter Team)

F-84G

508TH STRATEGIC FIGHTER WING
Turner AFB, Albany, Georgia

AIRCREW

Col C. Y. Wilson
Capt. D. W. Maggert
Capt R. J. Schueler
1/Lt W. H. McMurray
1/Lt C. K. Overstreet
1/Lt R. D. Williams

GROUND CREW

L/Col J. J. Lynch
M/Sgt C. L. Edwards
T/Sgt Forbes
S/Sgt R. N. Haynie
S/Sgt R. C. Howell
S/Sgt M. G. Jensen
S/Sgt A. J. Pajakinas
S/Sgt D. A. Richardson
S/Sgt E. J. Zitta
A/1C L. B. Berendsen
A/1C Giordano
A/1C L. J. Grong
A/1C P. Howell
A/1C Vernon M. Lewis
A/1C R. J. Pomfret
A/1C J. Reese
A/1C I. W. Skinner
A/1C W. F. Wagoner
A/2C G. Bomer
A/2C C. Lindsay
A/2C A. G. Robinson
A/2C J. R. Tierney
A/2C T. E. Whingham
Mr. W. Bonar
Mr. G. A. Watson

UNITED STATES AIR FORCES IN EUROPE

(Special Delivery Team)

F-84G

20TH FIGHTER BOMBER WING

AIRCREW

Col J. A. Dunning
Maj J. J. Kropenick
Capt W. G. Center, Jr
Capt A. C. Edinburgh
Capt S. G. Houghtby
Capt A. S. Nelson

GROUND CREW

Capt R. M. Hodges
Capt E. K. Jones
1/Lt J. G. Abraham
1/Lt R. J. Layton
1/Lt W. J. Warren
T/Sgt G. K. Holmes
T/Sgt L. J. Hemmersbach
T/Sgt B. R. Jones
T/Sgt R. W. Remington
T/Sgt L. E. Rodenbary
T/Sgt L. E. Van Camp
S/Sgt J. P. Desmond
S/Sgt D. R. Holmberg
S/Sgt W. H. Jones
S/Sgt W. Kerce
S/Sgt J. A. McClure
S/Sgt H. McLester
S/Sgt T. McMasters, Jr
S/Sgt N. W. Robertson
A/1C H. E. Carter
A/1C C. R. Goins
A/1C E. L. Hammersley
A/1C G. W. Holloway
A/1C P. L. Houser
A/1C C. E. McLeod, Jr
A/1C D. E. O'Farrell
A/1C R. E. Redbrook
A/1C C. E. Sellers
A/1C R. D. Young
A/2C G. J. Miller

STRATEGIC AIR COMMAND

(Special Delivery Team)

F-84-G

31ST STRATEGIC FIGHTER WING
Turner AFB, Albany, Georgia

AIRCREW

Col C.E. Wheeler
Capt C.G. Cleveland
Capt W. Foss
Capt B.J. Lincoln
1/Lt V.E. Rex
1/Lt L.C. Smith

GROUND CREW

Capt K.J. Blanchard
Capt R.F. Burns
T/Sgt E.J. Brown
T/Sgt J. Rodriguez, Jr
S/Sgt K.A. Anderson
S/Sgt D.M. Callaham
S/Sgt J.J. Cazanaugh
S/Sgt R.W. Elkins
S/Sgt D. Kirk
S/Sgt J.P. Lozar
S/Sgt J.C. Reid
S/Sgt B.C. Wiezorek
A/1C R.M. Cooke
A/1C J.H. Grand field
A/1C T.W. Janeway
A/1C R.A. Johlke
A/1C F. Nedoruscik
A/2C J. Akin, Jr
A/2C J.R. Googin
A/2C J.T. Marfia
A/2C C.B. Mead, Jr
A/2C E.R. Merritt
A/2C S.M. Millo
A/2C L.E. Stillabower
A/B J.A. Torchia

AIR TRAINING COMMAND

(Special Delivery Team)

F-84G

3600TH FLYING TRAINING WING
Luke Air Force Base, Arizona

AIRCREW

Col L. R. Chase
Maj M. G. Armstrong
Capt J. E. Chikar
Capt J. T. Quinn
1/Lt A. L. Atwell
1/Lt G. L. Clapham

GROUND CREW

T/Sgt T. L. Aitken
T/Sgt R. J. Jaquest
S/Sgt A. C. Allen
S/Sgt A. E. Brown
S/Sgt R. Hooks, Jr
S/Sgt R. G. Tennant
A/1C N. B. Fancher
A/1C C. G. Harris
A/1C T. W. Godwin
A/1C W. G. Hayes, Jr
A/1C R. H. Kammer, Jr
A/1C W. L. Kemp
A/1C F. Leber
A/2C H. H. Bohlin
A/2C E. R. Prevatt
A/2C M. D. Robison
A/2C L. A. Yarush
A/2C W. R. Spark

FAR EAST AIR FORCE

(Special Delivery Team)

F-84G

49TH FIGHTER BOMBER WING

AIRCREW

Col G. L. Pritchard
Capt L. Rogers
1/Lt A. W. Banister
1/Lt W. L. Kirk
1/Lt M. L. Walters
1/Lt W. T. Barnett

GROUND CREW

2/Lt B. G. Rippy
M/Sgt E. T. Cornpell
M/Sgt W. D. Gamble, Jr
T/Sgt M. Bowen
T/Sgt E. T. Epps
T/Sgt J. R. Jenkins
S/Sgt W. H. Lane
S/Sgt W. Johnson, Jr
S/Sgt D. Mark
S/Sgt R. L. Raymond
S/Sgt R. A. West
A/2C N. L. Rollins
A/1C H. E. Bauer
A/1C G. F. Crouch
A/1C B. D. Cummings
A/1C F. E. Elias
A/1C M. D. Erdmann
A/1C D. E. Hurdel
A/1C L. G. Kilson
A/2C W. Fernandez
A/2C R. W. Maynor
A/2C M. L. Mitchell
A/2C E. R. Ponce
A/2C J. L. Williams

REFINED NELLIS HARMONIZATION PROCEDURE FOR THE F-86

The May edition of the Fighter Weapons Newsletter contained an article on Harmonization theory and application. The Refined Nellis Harmonization Procedure reflects an application of that theory.

If you recall, depressing the sight line a slight amount to compensate for a one "G" trajectory shift condition is only valid when the sight is manually caged or used in such a manner that it is not allowed to compute properly, i.e., "Electrically Caged Sight" technique presently in wide use for panel strafing.

Since the sight should be used in its computing function for all air-to-air gunnery, all computations for basic or one "G" trajectory shift should be referenced to the actual air to ground firing conditions.

With this in mind the Fighter Weapons School has selected 3000' as the average altitude for air to ground firing, 350K IAS as the average firing airspeed and has taken into consideration the following items:

a. Aircraft angle of attack decrease in a dive with 20^{O} selected as the average dive angle for air to ground gunnery.

b. NACA true airspeed graphs to remove the approximations from calculating true airspeed when solving the trajectory shift formula.

c. F-86 angle of attack information as furnished by North American Aviation.

From the above data, we find that the trajectory shift occurring has a value of 3.5 mils. This means that to an observer on the ground, the bullets will assume a flight path 3.5 mils away from the fixed bore line towards flight path of the aircraft.

We all know that the zero prediction sight line in the F-86 is quite some distance above the fixed bore line of the guns. If we merely depressed the sight on the target, at 1000', 3.5 mils or feet, below the fixed bore line of the guns, we would incorporate a slight error because the sight line is not coincident with the mean gun bore line in the aircraft. This error is minimized almost to an infinitesimal quantity by placing the pip on a point slightly elevated above the actual effective bore line of the guns. This has an added advantage in that the pip is more easily located on the target. An illustration of this effect is diagrammed in illustration "A" and "B".

To provide a working relationship between harmonization of the variable rocket depression unit of the A-4 Sight, and gunfire harmonization, locate all pips on their respective target reference points with the A-4 Sight electrically caged.

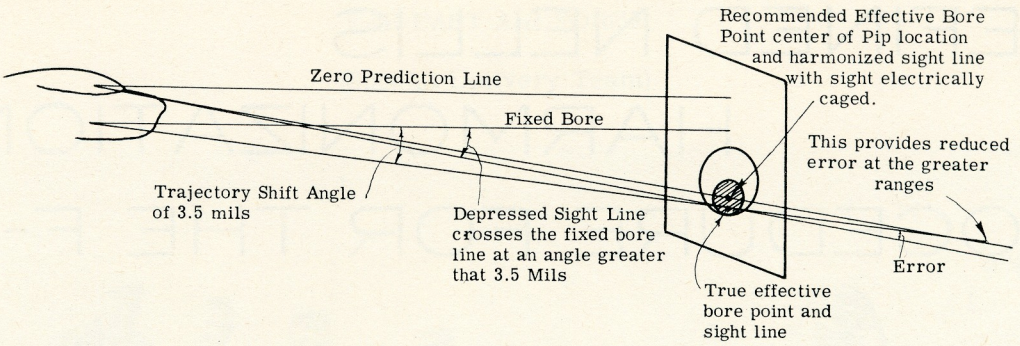


ILLUSTRATION "A"

REVISED NELLIS HARMONIZATION PROCEDURE FOR THE F-86

1000' Fire-in Range

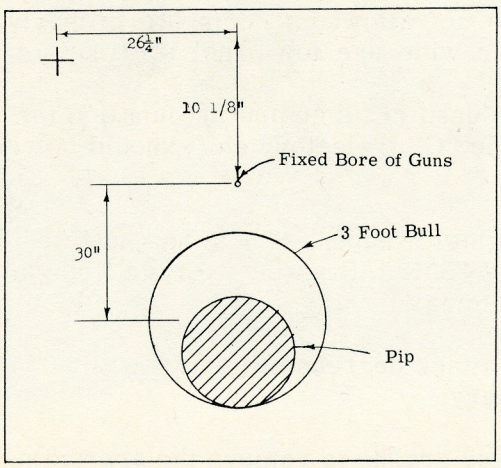


ILLUSTRATION "B"

1000' FIRE-IN TARGET F-86A, E&F

-- REFERENCE DATA --

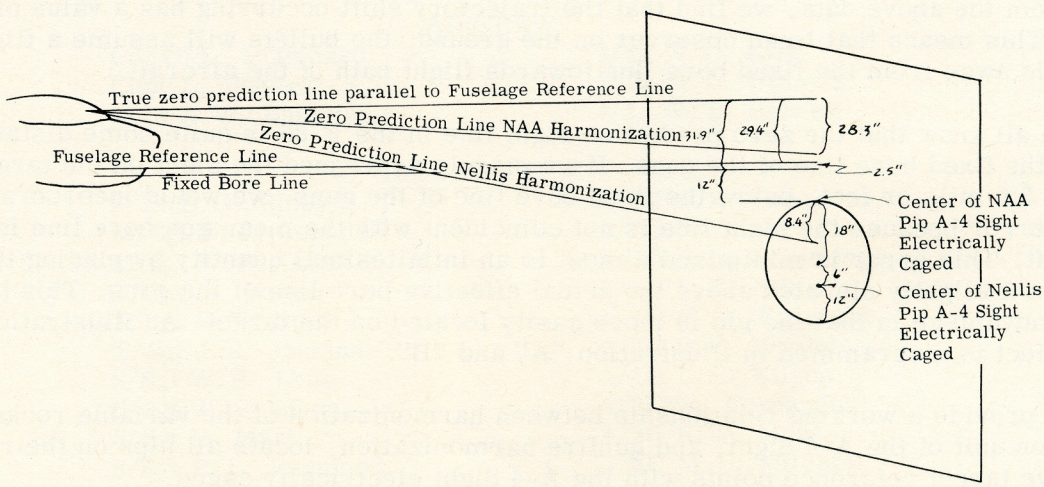


ILLUSTRATION "C"

The May issue of the Fighter-Weapons Newsletter contained a lengthy article on the A-4 GBR Sight Variable Rocket Depression Unit, the Rocket Ballistics Tables associated with this Unit and the method of harmonizing the Unit.

As of the time that this edition of the Fighter-Weapons Newsletter goes to press, the Training Research and Development Section of the Fighter Weapons School is nearing the end of an extensive project designed to serve a threefold purpose; first, to determine the validity of the Rocket Ballistics Tables furnished by the manufacturer of the VRDU; second, to ascertain the feasibility of the FWS adopting this unit in its designed mode for rocket fire; and third, to establish the optimum training techniques and methods to be utilized in conjunction with this unit.

Preliminary results of the project indicate that the rocket ballistics tables are grossly in error and should not be utilized by any Air Force activity. In addition, the harmonization procedure for this unit must be altered in order to hit at what is deemed to be optimum dive angles and slant ranges for rocketfire. The unit itself appears to have strong possibilities however. Pilot reactions to date indicate that the VRDU is the best aid to air-to-ground rocketfire to have yet been developed.

In the next edition of the Fighter-Weapons Newsletter you may look forward to an article on the Variable Rocket Depression Unit which will contain proven techniques for harmonizing the unit and flying with it in an air-to-ground rocket pattern.

* * * * * * *

* * * * *

* * *

Since our last Newsletter, the flow of fighter unit insignia patches and decals for our world map of "Tiger" outfits has certainly been steady. As of this date, ANG leads with the best display, followed by SAC, TAC, and ATRC. To Colonel John Dunning and the 20th Fighter Bomber Wing in USAFE goes the Blue Ribbon for their presentation to the FWS of a complete set of elaborate insignia shields - How 'bout checking with your C.O. today to see if your unit has contributed?

LET'S GET IN THE ACT

Contributions to the "MY OPINION" feature in the Newsletter are solicited from all personnel who have information which will be of value to the USAF Fighter effort. Material submitted can be on any Fighter Weapons subject, including operations, maintenance, supply, electronics, training, targets, etc.

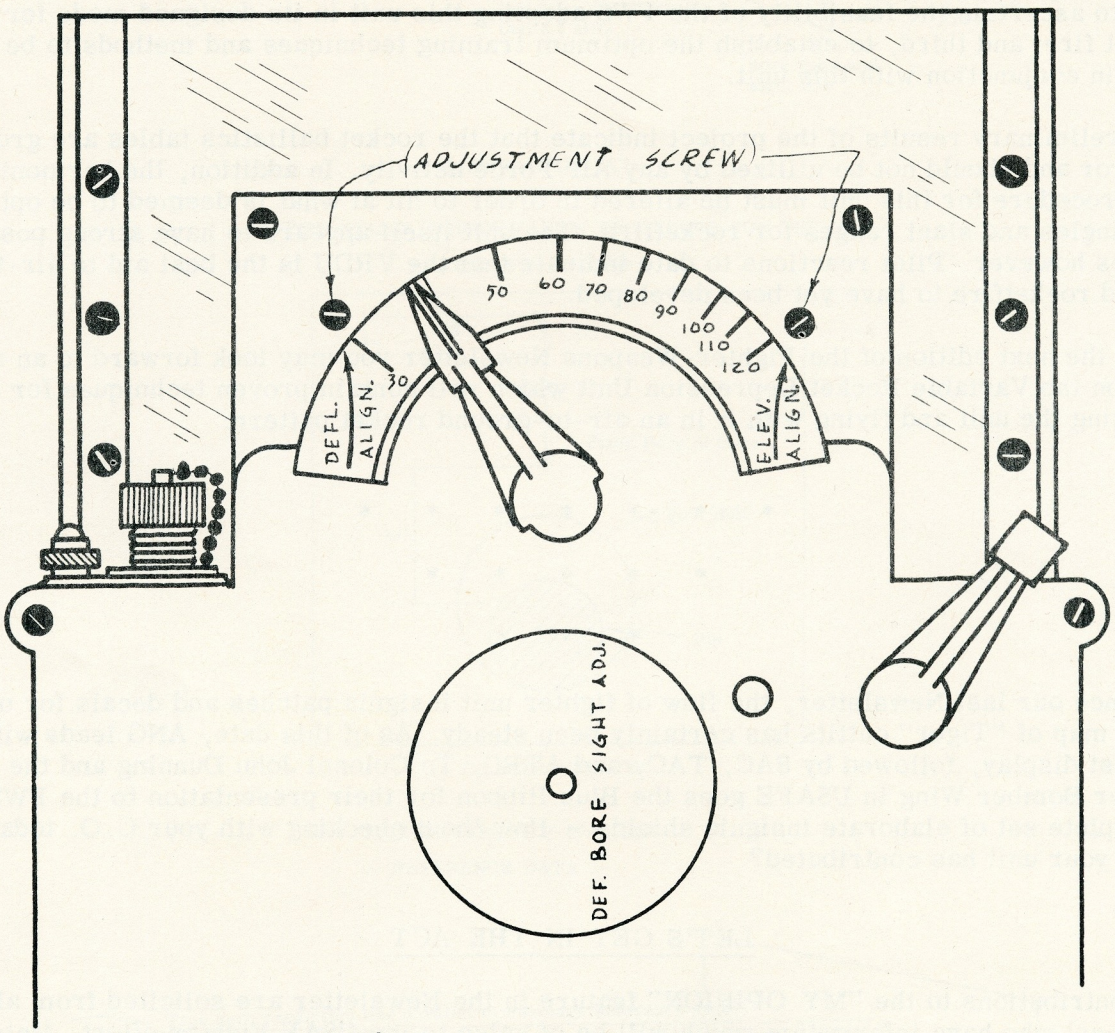
This is your chance to expound and give everyone the benefit of you ideas. Let's hear from you.

* * *

* * * * *

* * * * * * *

ELEVATION & DEFLECTION BORESIGHT ADJUSTMENTS
A-4 SIGHTHEAD MODIFICATION



A-4 SIGHT HEAD

Figure 1

A-4
SIGHTHEAD MODIFICATION

FROM THE A.C. SPARK PLUG TECH. REP.

All of you that have ever fired on a ground target with the A-4 sight in the mechanically caged position have probably noticed that in some instances there is an appreciable difference between the position of the pipper when mechanically caged and when it is electrically caged. This difference is usually referred to as "caging spread" or "Mechanical-Electrical Caging Uncertainty".

This caging spread is undesireable from an operational as well as from a maintenance standpoint. Because nearly all aircraft are harmonized in the Electrically Caged position, an erroneous aiming point would be used with the sight mechanically caged if a caging spread did exist. To obtain hits, the pilot would have to know what this spread is and compensate for it by holding the pipper in some position other than on the target.

You who are engaged in sight maintenance know what a job it can be to eliminate caging spread and for this reason, in many instances it has not been corrected. In the past, it has been necessary to either partially disassemble the sight head or the computer to correctly align the two zero positions. Unbalanced Elevation and Deflection amplifiers can also cause this "malfunction" and should be considered before other methods of correction are tried.

With the above information in mind, A.C. Spark Plug Div.-GMC. has devised a modification of the A-4 sight head which provides a method of eliminating caging spread without removing the sight head from the aircraft or even removing the sight head cover. This modification is explained in TOC 11-70BD-20. The following sight heads will be modified by the contractors prior to delivery:

A.C. Spark Plug Div. ----------	Serial No.	4919 and subsequent
Sperry Gyroscope Co. ---------	Serial No.	1614 and subsequent
Burroughs Corp. ----------	Serial No.	222 and subsequent
Mergenthaler Linotype Co. -----	Serial No.	111 and subsequent

The above listed sight heads will bear the M-2 modification symbol above the nameplate.

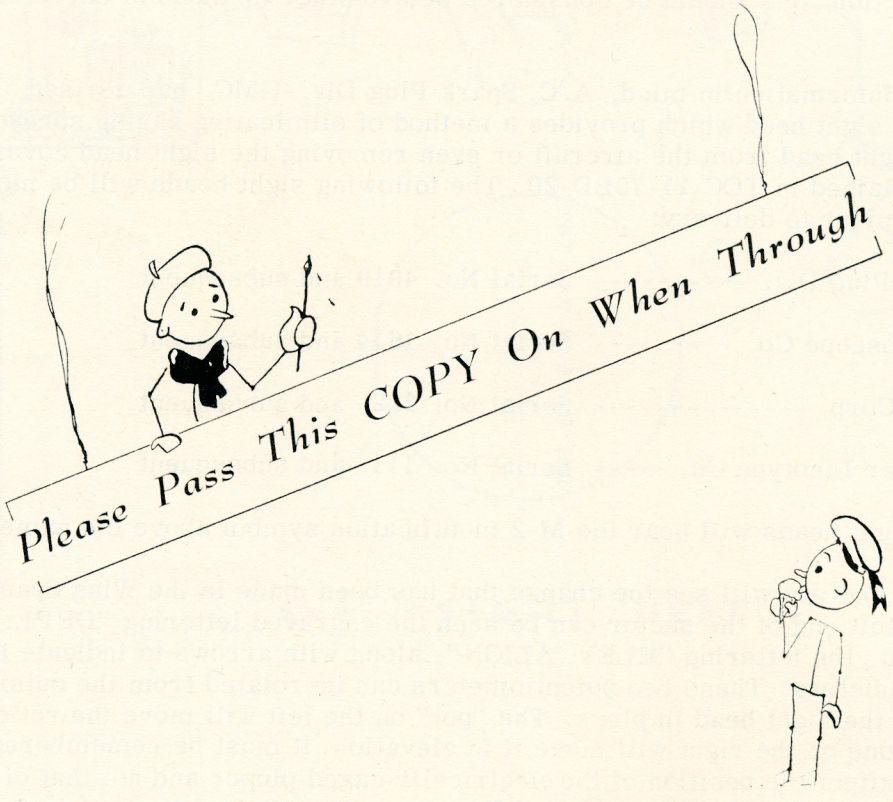
Refer to Fig. 1 and you will see the change that has been made in the Wing Span Sector Assembly. On the left end of the sector can be seen the engraved lettering "DEPL. ALIGN" and on the right end, the lettering "ELEV. ALIGN", along with arrows to indicate the position of two potentiometers. These two potentiometers can be rotated from the outside of the sight head with the sight head in place. The "pot" on the left will move the reticle in deflection and the one on the right will move it in elevation. It must be remembered that these adjustments affect the position of the electrically caged pipper and not that of the mechanically caged pipper. The Elevation and Deflection Boresight Adjustments for the mechanically caged pipper are the same as they have been in the past.

It is suggested that the amplifier balance be checked in the event that a caging spread is present before the new adjustments be made. This can be easily done by replacing the elevation and deflection amplifiers with two that are known to be balanced. An alternate method would be to switch the amplifiers and check to see if the spread has moved from the elevation channel to the deflection channel or vice versa, or if it has been affected at

all. Once it is established that the spread is not due to amplifier unbalance, the "DEFL. ALIGN" and/or "ELEV. ALIGN." adjustments should be used.

Now that it is possible to reposition the electrically caged pipper so easily, it is suspected that some outfits may harmonize their aircraft in the mechanically caged position then superimpose the electrically caged pipper on the mechanically caged one. This will be a good method but it should be remembered that anytime these new adjustments are used, the reticle position in rocketry will also be changed. It will be necessary to reboresight the rocket reticle by means of the "Boresight Adjustment" screw located on the Sight Selector Unit.

Another point that should be kept in mind, and may be a source of trouble if it is not remembered, is the fact that the potentiometers may be rotated 360° but only make electrical contact throughout 300°. This means that it will be possible to open the output circuit of the sight head microsyns. If this happens, the reticle will drift in either elevation or deflection according to which potentiometer is maladjusted.



My Opinion....

During the past month we have received two pieces of correspondence which merit serious consideration from all fighter commanders and pilots. Both of these approach the matter of U.R.'s from an exceptionally sound position, one which many of us have not realized in the past. We can help improve our Fighter Weapons and Weapons Systems if we give the following serious thought and then act!

FROM THE SPERRY GYROSCOPE COMPANY

"We have recently received the May 1954 issue of "Fighter Weapons Newsletter" and read the publication with considerable interest. The articles on Camera Gunnery and Harmonization were well planned and well written and they deserve the attention of all persons concerned with Fighter Weapons. We of the Field Service Engineering Department at Sperry Gyroscope Company Have been following fighter weapons and fighter fire control system problems for many years. We are always pleased when sound information is disseminated in such a thorough fashion.

Although your invitation for contributions to the "My Opinion" feature may not pertain to gunsight manufacturers, we would like to call your attention to a problem of considerable importance. This is the problem: What can the user of the MA-3 Fire Control System do to assist in the improvement of the equipment?

Equipment improvement, i.e. design change, manufacturing technique improvement, etc. comes about through two channels. (a) At the request of the Air Force, or (b) Through suggestions by the manufacturer. In any event, it is mandatory for the manufacturer to forward an Engineering Change Proposal (we call it an ECP) to the Air Force asking that certain features of the equipment be modified. This ECP might have been issued as the result of an Air Force request or on the initiative of the manufacturer. Regardless of the main impetus, this fact is important: No equipment improvement can be made unless the Air Force approves the Engineering Change Proposal. Air Force approval of the ECP may be based on a known equipment defect or more likely the ECP will be approved on the basis of numerous Unsatisfactory Reports previously submitted by the using organizations.

ECP's submitted on the initiative of the manufacturer have little chance for approval since the Air Force can hardly justify the expenditure of large sums of money without having official documents covering the specific problem. Maintenance personnel and pilots have some tendency to accept equipment malfunctions and equipment shortcomings as a

normal course of events. They have concrete examples of equipment failure or unsuitability, but too often these points are not put into the proper official channel.

Timely and accurate Unsatisfactory Reports initiated by the using organizations play a major role in bringing forth new and better fighter weapons. The technical representatives assigned to cover this equipment are constantly alert to report any maintenance or operational problems. But these men make up only one-half of the team. We must have Unsatisfactory Reports to complete the job.

Some persons may ask why we ask to have this area of discussion circulated through the medium of this publication. Here's the answer: We believe that the Nellis Air Force Base "Fighter Weapons Newsletter" is more widely read among those concerned with Fighter Weapons, than any other document of its kind. Your comments and suggestions on the foregoing paragraphs are earnestly desired."

FROM THE SPERRY TECH. REP.

"There is reason to believe that some activities do not submit Unsatisfactory Reports on their Fighter Weapons Systems because they consider it a reflection against their Organization or the Manufacturer of the malfunctioning equipment. Since these conclusions are erroneous, it is the purpose of this article to point out the purpose of an Unsatisfactory Report and the attitude of the Manufacturer in receiving them.

It is not the intent or purpose of the U.R. System to bring discredit upon any Organization or Manufacturer. As the name implies, the purpose of the U.R. is to report an unsatisfactory condition that exists in a piece of equipment so that corrective action may be taken to eliminate those conditions. When a U.R. is submitted, it can also be said that the complying organization has taken one step toward an improved product and a more efficient Air Force.

The old story about the "chain" and "the weakest link" still holds true. In this case the "chain" is the Fighter Weapon and the "links" take the form of the aircraft frame, the engine, the fire control system, the armament and all the associated equipment installed in the aircraft. Since the Weapon itself is composed of these integral parts, it stands to reason that the performance of the Fighter Weapon depends on every piece of equipment installed in the Weapon.

In order to improve our present Fighter Weapons and insure better designs for the future, the term U.R. from the Manufacturer's stand-point could be interpreted as an "Urgent Request". In the majority of cases, Field Engineers keep the Manufacturer well informed of his malfunctioning equipment and the need for field modifications. The Manufacturer in turn bases his Engineering Change Proposals on these reports from the field. In some cases the Air Force Depots have no indication that trouble is being experienced in the field because they have no U.R.'s to substantiate the trouble. Under these conditions, many of the Manufacturer's Engineering Change Proposals that would definitely improve the equipment are disallowed because the number of U.R.'s submitted by the Using Organization was insufficient to authorize the proposed change. It is true that the Technical Representatives at the using activities can initiate U.R.'s and assist in the writing of the reports, but it is up to the using Organization to follow through by routing them to the proper channels in order to achieve the desired results.

It must be rememberd that most of the modifications and corrective actions accomplished in the field are a direct result of information obtained from U. R.'s. So whether the U. R. is interpreted as an Unsatisfactory Report or as an Urgent Request, it accomplishes the same thing. Don't sit back and depend on the other fellow to improve the effectiveness of your Fighter Weapons. The efficiency of the Air Force is dependent on you. It is essential that the appropriate Depot be informed by means of a U. R. of anything less than a 100% performance of any Fighter Weapon at your activity.

When was the last time you submitted a U. R. ?

* * *

* * * * *

* * *

We, at the FWS, would like to suggest two large areas wherein a tremendous amount of improvement is needed. The next time you fly, take a good look at the monstrosity they now call a gun camera (especially the sight mounted models). Have you ever seen a more forgotten, second thought, piece of equipment? Don't you like the neat way the N-6 with special mounts fits in the F-86? Doesn't the vibration add a lot to the quality of your film? Don't you think its way past due for our sights to be built with integral cameras, built into the sight by the sight people to take pictures of what the sight is built to do? And let's not forget to include the requirement that an average pilot will have to load the thing, and that this average pilot should be provided with shutter and lens controls (simple ones) so that he can get the best film possible.

We almost hate to talk about this next item, because we sometimes feel that Rickenbacker probably used the same item and was just as unhappy with it. With all the marvels of the electronic age, and the vast developments in the field of photography, who has the corner on the black and white film racket. Why do we persist in using this stuff that two wars have proven to be poor, unreliable, and inferior to color film. If the film itself is not poor, then somewhere along the line something is too difficult or complex for the average G. I. to work with. Black and white film in civilian cameras, processed by civilians seems to be pretty good. Where are the trouble areas? All we, as pilots, want is film with which we can reliably confirm our combat firing, and by the study of which we can reliably assess our training gunnery. Is that asking too much? There certainly a lot of wasted gunnery missions caused by the pilots being unable to assess their film and determine what their mistakes are. In fact, you can probably attribute the present day failure of gun camera gunnery programs to the time-developed disgust of continually attempting to assess poor film.

LET'S GET BUSY WITH THOSE U. R.'s!

...COMMENTS PLEASE!...

DID THIS NEWSLETTER MEET WITH YOUR SATISFACTION? DID WE PRESENT ANY NEW INFORMATION TO YOU? WHAT WOULD YOU LIKE TO SEE DISCUSSED (FIGHTER-GUNNERY-WISE) IN FOLLOWING ISSUES? WITH WHAT DID YOU DISAGREE? HOW ARE YOU DOING IT?

There was never a technique that couldn't be improved, or a procedure that applied under all circumstances. Any technique or procedure that we recommend or advocate in this Newsletter is the way we do it at the Fighter Weapons School, and then only after our Research and Development Section has thoroughly studied it from every available angle and we have put a lot of "mileage" on it training students. We will never claim that it is the best way; we allow you the prerogative of your own convictions. So if your way has merit, let us know and we'll gladly give it a serious whirl.

To those of you with literary talent, we extend an invitation to contribute to our "My Opinion" feature. This is your chance to be heard. In addition, articles on your Gunnery Programs, Gunnery Meets, Towing Techniques and all matters involved in Fighter Gunnery are solicited.

Address

All correspondence concerning the Fighter Gunnery Newsletter, the USAF Fighter Weapons School and its Research, Academic and Administrative Sections will be addressed to:

COMMANDER

USAF FIGHTER WEAPONS SCHOOL

NELLIS AIR FORCE BASE, NEVADA

* * * * * * *

Air Force--Williams AFB, Ariz/W5-540

Please Share This Copy!